Study of Hypertension and Hyperlipidemia in the Adolescent of Central India

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Research Article

Abstract: **Aim**: To study the prevalence of Hypertension and high lipid profile level among the adolescent in rural population of PHC, Anji. Dist. Wardha Maharashtra, INDIA. **Methods:** A cross sectional study was carried out among the adolescents (10-19 years) of Anji P.H.C. Sample size studied was 400, selected by random sampling. The sampling frame available with department of Community Medicine was used for drawing the sample. We collected the data on their socio-demographic variables and blood pressure of each adolescent was measured. Fasting blood sample was collected and result for lipid profile was obtained. **Results**: Prevalence of high blood pressure levels was found 24.4%, i.e. $\geq 90^{th}$ percentile for age, sex and height, higrtriglyceridemia was found to be 27.9% and 72.1% of subject had normal triglyceride level in the study population and highest prevalence of lower level of HDLc 58.3% was found. **Conclusion**: we conclude that there is definitely alarming situation as per prevalence of high blood pressure levels and hyperlipidemia are concerned, even in rural communities. The early identification of cardio metabolic risk factors can help with an attempt to prevent or delay metabolic syndrome, diabetes and cardiovascular disease.

Keywords: High blood pressure, Hypertriglyceridemia, Cardio metabolic risk factors.

Introduction

The hypertension and hypertriglyceridemia are the important components of metabolic syndrome. Therefore, the increasing prevalence of these components leads to metabolic syndrome. The relationship among blood pressure (BP), central obesity, and high levels of insulin observed in adults has also been detected in children and adolescents. [1] Arterial hypertension occurs frequently in association with visceral obesity and diabetes mellitus or glucose intolerance, and it is now accepted that all of these clinical conditions are part of a metabolic syndrome that also includes specific alterations in lipid metabolism and atherosclerotic cardiovascular disease.[2] Weiss *et al* has reported increasing trend of obesity among children and adolescent leading to increased prevalence of insulin resistance.[3] The resultant high level of sugar in blood is then stored as fat. This lead to development of cardio metabolic risk factors like high cholesterol, triglyceride level, and raised blood pressure. High insulin and sugar level promote the condition of inflammation in body. The coronary lesions or plaques are build up of fat, cholesterol and cell debris. These material stick to the inside of the arteries that have become rough due to inflammation and cause hardening of arteries which ultimately lead to heart attacks and strokes. Because of lifestyle changes and urbanization, the prevalence of cardio metabolic changes are becoming common in rural areas as well[4]. But very little information is available in this regard from rural area. Hence we have studied the prevalence high blood pressure and hypertriglyceridemia along with prevalence of metabolic syndrome among rural adolescents in area of a Primary Health Centre.

Material and Methods

A cross sectional study was carried out in rural area of Primary Health Centre. All adolescent in the age group of 10-19 years of Primary Health Centre Anji, were included in study. The subjects who were not willing to remain fasting or were not willing to participate in the study were excluded. The subjects were selected by using simple random sampling. The sampling frame available with department of Community Medicine was used for drawing the sample. The study was commenced after obtaining clearance from the Institutional Human Ethical Committee. The subjects were selected after obtaining written informed consent from them. Detailed history was taken including past and present status of health of parent, occupation, education, dietary intake and addiction of subjects etc. Using pre-designed proforma anthropometric measurement, and laboratory investigation like lipid panel compromising total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein, and very low density lipoprotein were noted in the pretested proforma. The subjects underwent anthropometric measurement, in where height and weight were measure by measuring tape and weight machine to the nearest 0.1cm and 0.1kg

respectively. Waist circumference was measure by measuring tape in horizontal plane at the midpoint between the bottom of the rib cage and above the top of the iliac crest with person breathing silently and BMI was calculated by dividing weight(kg) by height squared (m^2). Blood pressure was recorded with sphygmomanometer in right arm, in sitting position, three times in subjects after giving rest for 10 minutes between each recording. The systolic and diastolic high blood pressure is defined by Blood pressure value $\geq 90^{th}$ percentile for age sex and height.[5] Morning blood sample samples were taken from subjects, after an overnight fast (10-12 hr). Total cholesterol by CHOD - PAP method, Triglyceride by GPO - Trinder method and HDLc by phospotungstic acid method using XL-300 autoanalyser. The National Cholesterol Education Program (ATP III) definition modified for age will be used to define abnormal level of cardio-metabolic risk factors in adolescent.[6-8] The criteria are as follows.

1. Waist circumference at or above the 90^{th} percentile value for age and sex from sample population classified as having abdominal obesity
2. Triglyceride level $\geq$ 110mg/dl.
3. HDL cholesterol level $\leq$40mg/dl.
4. Systolic or diastolic high blood pressure was defined by blood pressure value $\geq 90^{th}$ percentile for age sex and height.[5]
5. Fasting blood glucose levels $\geq$100mg/dl.[9]

Presence of any three of five risk factor mentioned above were consider as metabolic syndrome. Statistical Analysis was conducted by using EPI-INFO software version 6.04 and Health Watch Pro version 3.1 software. Chi square test was applied to test the significance of difference between two group and p value < 0.05 considered as significant.

Results

We have 24.4% prevalence of high blood pressure and 27.9% prevalence of hypertriglyceridemia were found in our study subject.

Table 1: Distribution of high blood pressure

High blood pressure (percentile)	Number of Subjects	Prevalence
$\geq 90^{th}$	99	24.4
$< 90^{th}$	306	75.6
Total	405	100

[$\geq 90^{th}$ percentile for age sex and height is consider as high blood pressure]

Table 2: Distribution of hypertriglyceridemia.

Triglyceride (mg/dl)	Number of subjects	Prevalence
$\geq$110	113	27.9
<110	292	72.1
Total	405	100

[TG $\geq$ 110mg/dl is considered as hypertriglyceridemia]

Table 3: Association of age with high blood pressure and high triglyceride level

Age group (in year)	Total(n)	HBP n(%)	HDLc n(%)	HTG n(%)
<15	159	37(23.3)	86(54.1)	47(29.6)
$\geq$ 15	246	62(25.2)	150(61.0)	66(26.8)
Total	405	99(24.4)	236(58.3)	113(27.9)
p- Value	--	$\geq$0.05	$\geq$0.05	$\geq$0.05

[n=Number of subjects, HBP-High blood pressure, HDLc-high density lipoprotein cholesterol ($\leq$40mg/dl), HTG- high triglyceride.] The prevalence of high blood pressure was found to be 24.4%, It was highest (25.2%) in $\geq$15 year of age. Over all prevalence of hypertriglyceridemia was 27.9% in study population. The prevalence of hypertriglyceridemia was higher (29.6%) in<15 year of age and lowest (26.8%) in $\geq$15 year of age. The overall prevalence of lower level of HDLc was found to be 58.3% in study population. High prevalence of lower level of HDLc 61% in $\geq$15 year of age and 54.1% in <15 year of age.

Table 4: Association of sex with high blood pressure and high triglyceride level

Sex	Total(n)	M.S n(%)	HBP n(%)	HDLc n(%)	HTG n(%)
Male	182	14(7.7)	43(23.6)	103(56.6)	47(25.8)
Female	223	26(11.7)	56(25.1)	133(59.6)	66(29.6)
Total	405	40(9.9)	99(24.4)	236(58.3)	113(27.9)
p-Value	--	$\geq$0.05	$\geq$0.05	$\geq$0.05	$\geq$0.05

The highest prevalence (25.1%)of high blood pressure in female against 23.6% in male. The prevalence of lower level of HDLc (59.6%) high in females than (56.6%) in males. Also the prevalence of hypertriglyceridemia was found to be higher (29.6%) in females than (25.8%) in males.

Association of family history of obesity with high blood pressure and high triglyceride level The cardio metabolic risk factors found to be higher in the subjects with family history of obesity than the subjects with no history of obesity. The prevalence of high blood pressure was found to be higher (30.2%) in the subject with family history of obesity and lower (23.8%) in the subjects with no family history of obesity. The prevalence of lower level of HDLc (67.4%) was found to be higher in the subject with family history of obesity. The hypertriglyceridemia was found to be similar (27.9%) in subject with and without family history of obesity.

Table 5: Association of family history of obesity with high blood pressure and high triglyceride level

Family history of Obesity	Total(n)	HBP n(%)	HDLc n(%)	HTG n(%)
Yes	43	13(30.2)	29(67.4)	12(27.9)
No	362	86(23.8)	207(57.2)	101(27.9)
Total	405	99(24.4)	236(58.3)	113(27.9)
p-Value	--	$\geq$0.05	$\geq$0.05	$\geq$0.05

[n=Number of subjects, HBP-High blood pressure, HDLc-high density lipoprotein cholesterol (≤40mg/dl), HTG- high triglyceride,]

Association of family history of hypertension with high blood pressure and high triglyceride level

The cardio metabolic risk factors found to be higher in the subject with family history of hypertension than the subject with no family history of hypertension. The prevalence of high blood pressure was found to be higher (29.2%) in the subject with family history of hypertension. The high prevalence of lower level of HDLc (66.7%) and hypertriglyceridemia (33.3%) were found higher in the subject with family history of hypertension.

Table 6: Association of family history of hypertension with high blood pressure and high triglyceride level

Family History of Hypertension	Total (n)	HBP n(%)	HDLc n (%)	HTG n (%)
Yes	24	7(29.2)	16(66.7)	8(33.3)
No	381	92(24.1)	220(57.7)	105(27.6)
Total	405	99(24.4)	236(58.3)	113(27.9)
p-Value	--	≥0.05	≥0.05	≥0.05

[n=Number of subjects, HBP-High blood pressure, HDLc-high density lipoprotein cholesterol (≤40mg/dl), HTG- high triglyceride,]

Discussion

Dyslipidemia

Cardiovascular diseases are the major cause of morbidity and mortality in our society with dyslipidemia contributing to atherosclerosis. Thus measurement of serum lipid would help in identifying the subject with cardio metabolic abnormalities or at risk of cardiovascular diseases. The childhood obesity has been associated with elevated serum levels of total cholesterol, triglycerides, and low-density lipoproteins (LDLc).[10] in the present study, the prevalence of hypertriglyceridemia and increased lower level of high density lipoprotein cholesterol were found being 27.9% and 58.3% respectively. The prevalence of lower level of high density lipoprotein cholesterol was found high 59.6% in females. The prevalence of hypertriglyceridemia was found to high in females (29.6%) than in males (25.8%). Similarly, Krishna *et al*[11] found that prevalence of hypertriglyceridemia was observed in 62.1% of girls and 47.8% of boys. Thus, dyslipidemia being risk factor for macrovascular complications, regular screening and intervention is necessary to prevent premature atherosclerosis. We found prevalence of dyslipidemia to be higher in the subjects with family history of obesity, hypertension. Thus, the subjects from these families were at more risk for developing disease including cardiovascular and diabetes in future. However, the prevalence did not differ significantly with family history of obesity (p≥0.05).

Hypertension

In the present study, we found overall prevalence of high blood pressure to be 24.4%. Another study from the same area found the prevalence of hypertension in rural area to be 5.8%[12] Goel *et al* in their study on students aged 14–19 years in New Delhi found 6.4%of adolescents to be hypertensive.[13] In the present study, prevalence of high blood pressure was 25.1% in females as against 23.6% in males. However, the higher prevalence of high blood pressure among female was not significantly associated with high blood pressure (p≥0.05). Similarly, Ximena *et al*, found higher prevalence of hypertension in females (22.3%) as compared to males (18.9%).[14] In the present study, prevalence of hypertension did not differ significantly with age (p>0.05). In contrast to several other studies, present study didn't significant association of family history of hypertension with adolescent high blood pressure. A population-based study of students aged 14–19 years in New Delhi found hypertension to be positively correlated with family history of hypertension.[13] Also, Soudarssanane *et al* found that the prevalence of hypertension was higher among subjects with positive family history of hypertension.[15] A higher prevalence in our study could be due to the difference in definition used, difference in study area and different composition of study population.

Conclusion

Thus, the present study reveals that increasing trend of hyperlipidemia and increase level of blood pressure is major health problem in rural area, indicating that cardio metabolic risk factors is not necessarily condition of urban area. Therefore, we conclude that there is definitely alarming situation as per prevalence hyperlipidemia and increase level of blood pressure are concerned, even in rural communities. The early identification of cardio metabolic risk factors can help with an attempt to prevent or delay metabolic syndrome, diabetes and cardiovascular disease. The adolescent from affluent family, family history of obesity, hypertension and diabetes are at high risk, thus, need to modify their lifestyle to prevent non-communicable diseases, particularly heart disease, stroke and diabetes in future.

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